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A RAPID METHOD FOR THE ESTIMATION OF LARGE NUMBERS OF FULL-GROWN LARVAE OF THE RAISIN MOTH

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Larvae of the raisin moth (Ephestia figulilella Gregson) which complete their growth in California dried fruits in open storages in the fall migrate from the fruit in search of hibernation quarters. In an attempt to gain information about the extent of this migration in the fall of 1934, flat-bottomed wooden troughs filled with water were set close against the sides of stacks of boxes of raisins from which larvae were migrating. Larvae falling from the side of the stack were entrapped and drowned. The numbers in the troughs when daily collections were made frequently were so great that counting was impracticable, necessitating the development of a rapid method for estimating numbers.

The method used was similar to that previously described by Barnes [2] in that the larvae were introduced into a graduated tube and were compressed by a plunger before the total was read.

The tube consisted of a hydrometer cylinder 12 inches high by 1½ inches inside diameter. The plunger, cut from a sheet of bakelite, was turned down on an emery wheel to fit snugly in the cylinder, and was bolted to one end of a ¼-inch steel rod 18 inches long in such fashion that the bottom side of the plunger presented a smooth surface. Since the larvae were in water, and were more or less water-logged, the plunger was drilled full of ⅛-inch holes to allow water to pass upward when the plunger was forced down on the larvae in the cylinder.

It was found that, with larvae in the cylinder and the plunger being forced down slowly by hand pressure, gradual compaction of the mass of larvae ceased, coming to an abrupt stop at a point which is designated herein as the "rest point". Additional pressure resulted in the disruption of larval bodies and the escape of body fluid through the plunger. Rest points (prior to general body rupture) for counted numbers of larvae were indicated on the graduated

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[1] The writer is indebted to Charles D. Fisher, Chief Chemist, Dried Fruit Association of California, for material assistance in the development of this method.

[2] Barnes, Dwight F. Methods and apparatus developed for studying dispersion of nitidulids. ET-51, May 1935.

scale in units of 200 from 2,000 to 7,000. The numbers were marked on a strip of heavy linen cloth glued to the tube.

The full-grown larvae which accumulated in the water-filled trough were scooped out with a flat-bottomed wire dipper slightly narrower than the width of the trough. They were emptied into a wide-mouthed funnel and were washed into the cylinder with water. The plunger, inserted in the cylinder, was forced down to the rest point, and the indicated number was read off on the scale. Repeated checks of measured numbers of larvae showed the method to be accurate within plus or minus 100. For example, a lot which measured 6,000 larvae contained 5,985 by actual count.

This method may be of value for use with other species in the estimation of large numbers of larvae of approximately uniform size. Its contributions to similar methods are: The perforated plunger to allow the escape of water or other fluid and the determination that a definite rest point is reached during the compression of larvae just prior to the rupturing of the compacted bodies.